

Claims:

1. A load handling system for manipulating a load onto and off of a vehicle, said load handling system comprising:

a connector for connecting the load handling system to the load;

at least three axes about which the connector moves relative to the vehicle during loading and unloading; and

at least one support arm fixedly connected to the vehicle, wherein each of said at least one support arm fixedly connected to the vehicle remains connected to the vehicle throughout the loading and unloading process, and wherein none of said at least one support arm fixedly connected to the vehicle reversibly engages the vehicle as a prerequisite for enabling said connector for connecting the load handling system to the load to move about three axes relative to the vehicle during loading and unloading.

2. A load handling system of claim 1, wherein said connector for connecting the load handling system to the load includes a hook, a clamp, a strap, a chain, or a magnet.

3. A load handling system of claim 1 further comprising at least one lift mechanism.

4. A load handling system of claim 3, wherein each of said at least one lift mechanism includes a hydraulic actuator, a pneumatic actuator, or a screw-type actuator.

5. A load handling system of claim 3, wherein said connector for connecting the load handling system to the load includes a hook, a clamp, a strap, a chain, or a magnet.

6. A load handling system of claim 1 further comprising:

a first support arm having a first end and a second end, said first support arm attached to the connector for linking the load handling system to a load, said connector disposed near said first end of said first support arm;

a second support arm having a first end and a second end, said first end being pivotally connected to the first support arm at a point between the ends of said first support arm, said second end being pivotally connected to a last support arm;

a last support arm having a first and second end, said second end being pivotally connected to said vehicle, said last support arm being pivotally connected to the second support arm at a point on the last support arm between said first and second ends of said last support arm;

a first lift mechanism having a first end and a second end, the first end of said first lift mechanism being pivotally connected to the first support arm at a position near to the second end of said first support arm, and the second end of said first lift mechanism being pivotally connected to the second support arm at a position between the first and second end of the second support arm, said first lift mechanism being capable of rotating said first support arm with respect to said second support arm;

a second lift mechanism having a first end and a second end, the first end of said second lift mechanism being pivotally connected to the second support arm at a position near to the first end of said second support arm and the second end of said second lift mechanism being pivotally connected to the last support arm at a position near to the first end of the last support arm, said second lift mechanism being capable of rotating said second support arm with respect to said last support arm;

a last lift mechanism having a first end and a second end, the first end of said last lift mechanism being pivotally connected to the last support arm at a position between the first and second ends of said last support arm and the second end of said last lift mechanism being pivotally connected to said vehicle, said last lift mechanism being capable of rotating said last support arm with respect to said vehicle.

7. A load handling system of claim 6, wherein said connector for connecting the load handling system to the load includes a hook, a clamp, a strap, a chain, or a magnet.
8. A load handling system of claim 6 wherein each of said first, second, and last lift mechanisms includes a hydraulic actuator, a pneumatic actuator, or a screw-type actuator.
9. A load handling system of claim 1, wherein the vehicle is a Heavy Expanded Mobility Tactical Truck (HEMTT).

10. A vehicle for moving a load, said vehicle comprising

- a front end;
- a rear end; and
- a load handling system for manipulating a load onto and off the vehicle, said load handling system comprising:
 - at least three support arms generally serially disposed so that there is a first support arm, a second support arm, and a last support arm, each of said support arms being pivotally connected with a support arm next adjacent in the series, said last support arm being pivotally connected to the vehicle;
 - wherein said load handling system has a transit configuration for carrying the load when the vehicle is in motion, said transit configuration being such that the pivotal connection between one of said at least three support arms and a next adjacent support arm closer in the series to the last support arm is at a position relative to the vehicle no closer to the rear end of the vehicle than is the position of the pivotal connection between said next adjacent support arm and the support arm that is next closer in the series to the last support arm as compared to said next adjacent support arm, the position of the pivotal connection between the next-to-the-last support arm and the last support arm being at a

position relative to the vehicle no closer to the rear end of the vehicle than is the position of the pivotal connection between the last support arm and the vehicle.

11. A vehicle of claim 10 further comprising:

said load handling system further comprising:

a connector for connecting the load handling system to the load; and

at least three axes about which the connector moves relative to the vehicle during loading and unloading;

wherein said at least three axes correspond to pivotal connections between next adjacent support arms and to pivotal connections between a support arm and the vehicle, and wherein said transit configuration of the load handling system is such that said at least three axes are serially disposed such that a first axis that corresponds to the pivotal connection between one of the at least three support arms and the next adjacent support arm closer in the series to the last support arm has a pivotal-connection-crossing position that is no closer to the rear end of the vehicle than is the pivotal-connection-crossing position of a second axis corresponding to the pivotal connection between said next adjacent support arm and the support arm that is next closer in the series to the last support arm as compared to said next adjacent support arm, the pivotal-connection-crossing position of an axis corresponding to the pivotal connection between the next-to-the-last support arm and the last support arm being at a position relative to the vehicle no closer to the rear end of the vehicle than is the pivotal-connection-crossing position of an axis corresponding to the pivotal connection between the last support arm and the vehicle.

12. A vehicle of claim 10 further comprising:

a first support arm having a first end and a second end, said first support arm attached to

the connector for linking the load handling system to a load, said connector disposed near said first end of said first support arm;

a second support arm having a first end and a second end, said first end being pivotally connected to the first support arm at a point between the ends of said first support arm, said second end being pivotally connected to a last support arm;

a last support arm having a first and second end, said second end being pivotally connected to said vehicle, said last support arm being pivotally connected to the second support arm at a point on the last support arm between said first and second ends of said last support arm;

a first lift mechanism having a first end and a second end, the first end of said first lift mechanism being pivotally connected to the first support arm at a position near to the second end of said first support arm, and the second end of said first lift mechanism being pivotally connected to the second support arm at a position between the first and second end of the second support arm, said first lift mechanism being capable of rotating said first support arm with respect to said second support arm;

a second lift mechanism having a first end and a second end, the first end of said second lift mechanism being pivotally connected to the second support arm at a position near to the first end of said second support arm and the second end of said second lift mechanism being pivotally connected to the last support arm at a position near to the first end of the last support arm, said second lift mechanism being capable of rotating said second support arm with respect to said last support arm;

a last lift mechanism having a first end and a second end, the first end of said last lift mechanism being pivotally connected to the last support arm at a position between the first and second end of said last support arm and the second end of said last lift mechanism being

pivottally connected to said vehicle, said last lift mechanism being capable of rotating said last support arm with respect to said vehicle.

13. A vehicle of claim 12 wherein said connector for connecting the load handling system to the load includes a hook, a clamp, a strap, a chain, or a magnet.

14. A vehicle of claim 12 wherein each of said first, second, and last lift mechanisms includes a hydraulic actuator, a pneumatic actuator, or a screw-type actuator.

15. A kit for converting a vehicle having a load handling system that raises a load to a first lowest maximum elevation during loading and unloading to a vehicle having a reconfigured load handling system that raises said load to a second lowest maximum elevation during loading and unloading, said second lowest maximum elevation being lower than said first lowest maximum elevation, and wherein said reconfigured load handling system comprises:

a connector for connecting the load handling system to the load;

at least three axes about which the connector moves relative to the vehicle during loading and unloading; and

at least one support arm fixedly connected to the vehicle, wherein each of said at least one support arm fixedly connected to the vehicle remains connected to the vehicle throughout the loading and unloading process, and wherein none of said at least one support arm fixedly connected to the vehicle reversibly engages the vehicle as a prerequisite for enabling said connector for connecting the load handling system to the load to move about three axes relative to the vehicle during loading and unloading.

16. A kit of claim 15 wherein said improved load handling system further comprises:

a first support arm having a first end and a second end, said first support arm attached to the connector for linking the load handling system to a load, said connector disposed near

said first end of said first support arm;

a second support arm having a first end and a second end, said first end being pivotally connected to the first support arm at a point between the ends of said first support arm, said second end being pivotally connected to a last support arm;

a last support arm having a first and second end, said second end being pivotally connected to said vehicle, said last support arm being pivotally connected to the second support arm at a point on the last support arm between said first and second ends of said last support arm;

a first lift mechanism having a first end and a second end, the first end of said first lift mechanism being pivotally connected to the first support arm at a position near to the second end of said first support arm, and the second end of said first lift mechanism being pivotally connected to the second support arm at a position between the first and second end of the second support arm, said first lift mechanism being capable of rotating said first support arm with respect to said second support arm;

a second lift mechanism having a first end and a second end, the first end of said second lift mechanism being pivotally connected to the second support arm at a position near to the first end of said second support arm and the second end of said second lift mechanism being pivotally connected to the last support arm at a position near to the first end of the last support arm, said second lift mechanism being capable of rotating said second support arm with respect to said last support arm;

a last lift mechanism having a first end and a second end, the first end of said last lift mechanism being pivotally connected to the last support arm at a position between the first and second end of said last support arm and the second end of said last lift mechanism being pivotally connected to said vehicle, said last lift mechanism being capable of rotating said last

support arm with respect to said vehicle.

17. A method of manipulating a load with respect to a vehicle comprising:

providing a load handling system that comprises:

a connector for connecting the load handling system to the load;

at least three axes about which the connector moves relative to the vehicle during loading and unloading; and

at least one support arm fixedly connected to the vehicle, wherein each of said at least one support arm fixedly connected to the vehicle remains connected to the vehicle throughout the loading and unloading process, and wherein none of said at least one support arm fixedly connected to the vehicle reversibly engages the vehicle as a prerequisite for enabling said connector for connecting the load handling system to the load to move about three axes relative to the vehicle during loading and unloading; and

using said load handling system to manipulate said load connected to said connector.

18. A method of claim 17 wherein in the step of providing, said load handling system further comprises:

a first support arm having a first end and a second end, said first support arm attached to the connector for linking the load handling system to a load, said connector disposed near said first end of said first support arm;

a second support arm having a first end and a second end, said first end being pivotally connected to the first support arm at a point between the ends of said first support arm, said second end being pivotally connected to a last support arm;

a last support arm having a first and second end, said second end being pivotally connected to said vehicle, said last support arm being pivotally connected to the second support arm at a

point on the last support arm between said first and second ends of said last support arm;

a first lift mechanism having a first end and a second end, the first end of said first lift mechanism being pivotally connected to the first support arm at a position near to the second end of said first support arm, and the second end of said first lift mechanism being pivotally connected to the second support arm at a position between the first and second end of the second support arm, said first lift mechanism being capable of rotating said first support arm with respect to said second support arm;

a second lift mechanism having a first end and a second end, the first end of said second lift mechanism being pivotally connected to the second support arm at a position near to the first end of said second support arm and the second end of said second lift mechanism being pivotally connected to the last support arm at a position near to the first end of the last support arm, said second lift mechanism being capable of rotating said second support arm with respect to said last support arm;

a last lift mechanism having a first end and a second end, the first end of said last lift mechanism being pivotally connected to the last support arm at a position between the first and second end of said last support arm and the second end of said last lift mechanism being pivotally connected to said vehicle, said last lift mechanism being capable of rotating said last support arm with respect to said vehicle.

19. The method of claim 17 wherein in the step of using, the load is moved from a vehicle into an aircraft.
20. The method of claim 19 wherein the load is moved directly from a vehicle into an aircraft.
21. The method of claim 17 wherein in the step of using, the load is moved from an aircraft into a vehicle.

22. The method of claim 21 wherein the load is moved directly from an aircraft into a vehicle.